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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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NATIONAL EUTROPHICATION SURVEY

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REPORT

ON

CATARACT LAKE

OWEN AND PUTNAM COUNTIES

INDIANA

EPA REGION V

WORKING PAPER No. 324

WITH THE COOPERATION OF THE

INDIANA STATE BOARD OF HEALTH

AND THE

INDIANA NATIONAL GUARD

MARCH, 1976

CONTENTS

	Page
Foreword	ii
List of Indiana Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	9
V. Literature Reviewed	14
VI. Appendice	15

F O R E W O R D

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning {§303(e)}, water quality criteria/standards review {§303(c)}, clean lakes {§314(a,b)}, and water quality monitoring {§106 and §305(b)} activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the New Jersey Department of Environmental Protection for professional involvement and to the New Jersey National Guard for conducting the tributary sampling phase of the Survey.

Douglas Clark, Chief of the Bureau of Water Quality Planning and Management, Mr. Frank Takacs, New Jersey National Eutrophication Survey Coordinator, Principal Environmental Specialist, and Robert Kotch, Senior Environmental Engineer, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

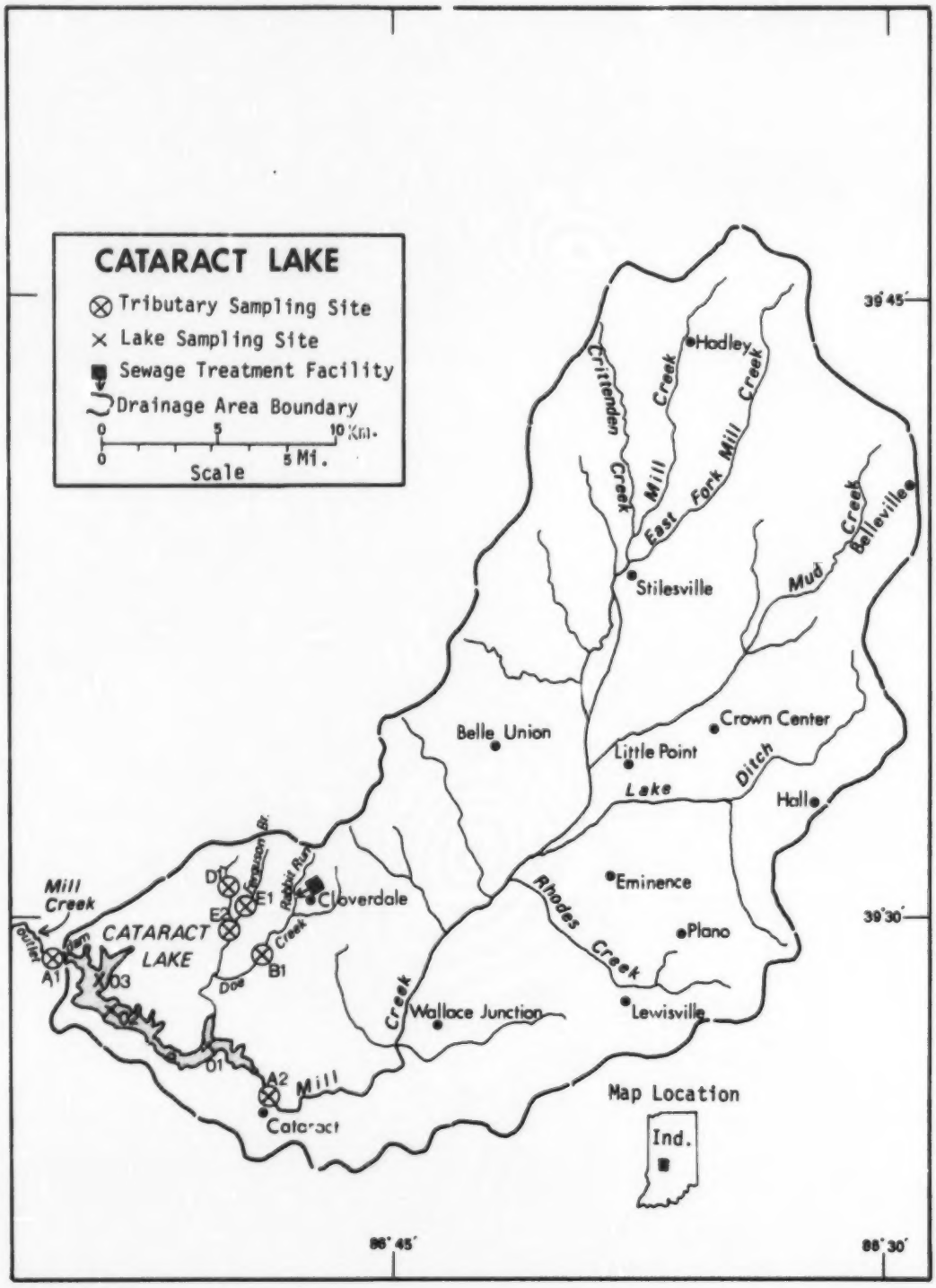
Major General William R. Sharp, Former Chief of Staff, Major General Wilfred G. Menard, Jr., Chief of Staff, and Project Officer Colonel Herbert D. Ruhlin, who directed the volunteer efforts of the New Jersey National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW JERSEY

LAKE NAME	COUNTY
Budd Lake	Morris
Duhernal Lake	Middlesex
Farrington Lake	Middlesex
Greenwood Lake	Passaic, N.J.; Orange, N.Y.
Lake Hopatcong	Morris, Sussex
Lake Musconetcong	Morris, Sussex
Oradell Reservoir	Bergen
Paulinskill Lake	Sussex
Pinecliff Lake	Passaic
Pompton Lakes	Passaic
Spruce Run Reservoir	Hunterdon
Union Lake	Cumberland
Wanaque Reservoir	Passaic


CATARACT LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 5 10 Km.
0 5 Mi.
Scale
39°45'
39°30'
86°45'
86°30'
Hadley
Crittenden Creek
Mill Creek
East Fork Mill Creek
Mud Creek
Belleville
Stilesville
Crown Center
Belle Union
Little Point
Lake Ditch
Hall
Eminence
Rhodes Creek
Plano
Lewisville
Wallace Junction
Creek
Mill
Cataract
Cloverdale
Ferguson Br.
Rabbit Run
Doe Creek
Mill Creek
outlet
dam
CATARACT LAKE
A1
A2
B1
D1
E1
E2
O1
O2
O3
Map Location
Ind.

CATARACT LAKE

STORET NO. 1805

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Cataract Lake is eutrophic. It ranked nineteenth in overall trophic quality when the 27 Indiana lakes sampled in 1973 were compared using a combination of six parameters*. Sixteen lakes had less and one had the same median total phosphorus, 16 had less and one had the same median dissolved phosphorus, 22 had less median inorganic nitrogen, ten had less mean chlorophyll a, and 18 had greater mean Secchi disc transparency. Hypolimnetic depletion or near-depletion of dissolved oxygen occurred at stations 2 and 3 in August and October.

Survey limnologists noted algal concentrations in May at stations 1 and 3.

Survey data compare well with data obtained in a previous study (Anonymous, 1974).

B. Rate-Limiting Nutrient:

The algal assay results indicate that Cataract Lake was phosphorus limited at the time the sample was collected (05/10/73). The lake data indicate phosphorus limitation at the other sampling times as well.

* See Appendix A.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Cataract Lake received a total phosphorus loading over four times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 13). The only measured point source, the Cloverdale wastewater treatment plant, contributed 2% of that load. However, it is probable that known but unmeasured point sources contributed significantly to the total phosphorus load (see below), and an adequate assessment of nutrient controllability cannot be made until the magnitude of the nutrient contribution from these sources can be determined.

Reportedly (McAhron, 1973), a hog farm impacts Ferguson Branch just downstream from station E-1 and another one impacts Doe Creek upstream from station B-1 (see map, page v). On the basis of the differences in the phosphorus export rates of the Cataract Lake tributaries, it is conservatively estimated that these two point sources contributed in excess of 2,000 kg of total phosphorus to the lake during the sampling year.

2. Non-point sources--During the sampling year, the phosphorus export rate of Mill Creek was somewhat high as compared to the rates of other Indiana streams sampled; however, the export N/P ratio indicates that if point sources are present in the drainage, they are minor.

On the other hand, the phosphorus export rate of Doe Creek was over twice that of Mill Creek, and it is probable that the difference is attributable to the unmeasured point source noted above. Also, the phosphorus export rate of Ferguson Creek at station E-2 is over three times the rate in this stream at station D-1 and in Ferguson Branch at station E-1, and the difference likely is due to the point source impacting this stream downstream from station E-1.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 5.66 kilometers^2.
2. Mean depth: 6.1 meters.
3. Maximum depth: 17.0 meters.
4. Volume: 34.538×10^6 m^3.
5. Mean hydraulic retention time: 50 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Mill Creek	657.3	7.14
Doe Creek	34.4	0.32
Ferguson Creek (E-2)**	24.9	0.11
Minor tributaries & immediate drainage -	39.7	0.40
Total	756.3	7.97

2. Outlet -

Mill Creek	762.0***	7.97

C. Precipitation****:

1. Year of sampling: 138.4 centimeters.
2. Mean annual: 103.1 centimeters.

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† Table of metric conversions--Appendix B.
†† Winters, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes areas of D-1 and E-1; see map, page v.
*** Includes area of lake; outflow adjusted to equal sum of inflows.
**** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Cataract Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at three stations on the lake (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 3.0 meters at station 1, 11.0 meters at station 2, and 11.0 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR CATARACT LAKE
STORET CODE 1805

PARAMETER	1ST SAMPLING (5/10/73) 3 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/ 8/73) 3 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/10/73) 3 SITES RANGE	MEAN	MEDIAN
TEMP (C)	11.9 - 19.2	16.1	17.0	21.9 - 27.9	25.1	24.4	19.0 - 24.5	22.2	22.3
DISS OXY (MG/L)	4.8 - 10.0	8.2	8.7	0.1 - 10.8	3.1	1.0	0.0 - 13.0	3.9	2.0
CNDCTVY (MCROMO)	380. - 430.	398.	395.	230. - 399.	281.	262.	293. - 410.	328.	301.
PH (STAND UNITS)	7.6 - 8.3	7.9	8.0	7.2 - 8.9	7.9	7.9	7.0 - 8.8	7.8	7.7
TOT ALK (MG/L)	138. - 160.	147.	146.	93. - 184.	116.	103.	124. - 200.	146.	130.
TOT P (MG/L)	0.031 - 0.109	0.058	0.046	0.034 - 0.201	0.082	0.067	0.032 - 0.268	0.093	0.049
ORTHO P (MG/L)	0.009 - 0.027	0.016	0.013	0.008 - 0.049	0.026	0.022	0.007 - 0.019	0.011	0.010
NO2+NO3 (MG/L)	2.050 - 2.880	2.611	2.780	0.650 - 1.830	1.225	1.250	0.030 - 0.060	0.047	0.050
AMMONIA (MG/L)	0.050 - 0.310	0.121	0.090	0.070 - 0.470	0.184	0.110	0.100 - 4.880	0.843	0.240
KJEL N (MG/L)	0.400 - 1.100	0.738	0.700	0.700 - 1.500	1.108	1.100	0.700 - 6.200	1.755	1.300
INORG N (MG/L)	2.190 - 3.110	2.732	2.850	0.760 - 1.910	1.409	1.460	0.140 - 4.930	0.890	0.300
TOTAL N (MG/L)	2.750 - 3.800	3.349	3.380	1.950 - 2.730	2.333	2.375	0.740 - 6.250	1.802	1.330
CHLRPYL A (UG/L)	5.9 - 12.5	9.5	10.1	4.4 - 19.6	10.0	6.0	7.2 - 21.1	12.7	9.9
SECCHI (METERS)	0.3 - 1.5	1.1	1.5	0.3 - 0.9	0.6	0.7	0.3 - 1.2	0.8	0.8

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/10/73	1. Centric diatoms	8,153
	2. Flagellates	385
	3. *Asterionella sp.*	256
	4. *Cryptomonas sp.*	183
	5. *Nitzschia sp.*	92
	Other genera	91
	Total	9,160
08/08/73	1. *Oscillatoria sp.*	477
	2. *Anabaena sp.*	477
	3. *Melosira sp.*	382
	4. *Aphanizomenon sp.*	223
	5. Flagellates	64
	Other genera	158
	Total	1,781
10/10/73	1. *Aphanizomenon sp.*	1,957
	2. *Oscillatoria sp.*	814
	3. *Anabaena sp.*	780
	4. Flagellates	191
	5. *Cyclotella sp.*	104
	Other genera	190
	Total	4,036

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (μg/l)
05/10/73	1	5.9
	2	10.1
	3	12.5
08/08/73	1	19.6
	2	4.4
	3	6.0
10/10/73	1	9.9
	2	21.1
	3	7.2

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.010	2.710	1.2
0.050 P	0.060	2.710	14.6
0.050 P + 1.0 N	0.060	3.710	16.8
1.0 N	0.010	3.710	1.4

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Cataract Lake was moderate at the time the assay sample was collected. The results also indicate the lake was phosphorus limited at that time. Note that the yield with the addition of nitrogen alone was not significantly different from the control yield, but the yield with the addition of orthophosphorus alone was over twelve times the control yield.

The lake data indicate Cataract Lake was phosphorus limited at all sampling times. The mean inorganic nitrogen to orthophosphorus ratios were 54 to 1 or greater, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Indiana National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of February and March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Indiana District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the nutrient loads, in $kg/km^2/year$, in Ferguson Creek at station D-1 and multiplying by the ZZ area in km^2.

The operator of the Cloverdale wastewater treatment plant provided monthly effluent samples and corresponding flow data.

* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Cloverdale	1,000	act. sludge	260.3	Rabbit Run

2. Known industrial - Reportedly (McAhron, 1973), a hog farm impacts Ferguson Branch just below station E-1, and another impacts Doe Creek above station B-1. These point sources were not measured, and their impact on Cataract Lake is not known.

* Davis, 1973.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Mill Creek	27,115	84.7
Doe Creek	2,860	8.9
Ferguson Creek (E-2)	890	2.8
b. Minor tributaries & immediate drainage (non-point load) -	395	1.2
c. Known municipal STP's -		
Cloverdale	635	2.0
d. Septic tanks* -	10	<0.1
e. Industrial - Unknown	?	-
f. Direct precipitation** -	100	0.3
Total	32,005	100.0

2. Outputs -

Lake outlet - Mill Creek 18,190

3. Net annual P accumulation - 13,815 kg.

* Estimate based on 40 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Mill Creek	966,785	93.3
Doe Creek	40,405	3.9
Ferguson Creek (E-2)	10,505	1.0
b. Minor tributaries & immediate drainage (non-point load) -	9,450	0.9
c. Known municipal STP's -		
Cloverdale	2,390	0.3
d. Septic tanks* -	425	<0.1
e. Industrial - Unknown	?	-
f. Direct precipitation** -	6,110	0.6
Total	1,036,070	100.0

2. Outputs -

Lake outlet - Mill Creek 766,615

3. Net annual N accumulation - 269,455 kg.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr	N/P Ratio
Mill Creek	41	1,471	36/1
Doe Creek	83	1,175	14/1
Ferguson Creek			
at E-2	36	422	12/1
at D-1	10	238	24/1
at E-1	13	329	25/1

* Estimate based on 40 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	5.65	2.44	183.1	47.6
Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Cataract Lake:				
"Dangerous" (eutrophic loading)			1.28	
"Permissible" (oligotrophic loading)			0.64	

V. LITERATURE REVIEWED

Anonymous, 1972. Cataract Lake survey of July 31, 1972. IN Div. Water Poll. Contr., Indianapolis.

Davis, Chester L., 1973. Treatment plant questionnaire (Cloverdale STP). Cloverdale.

McAhron, Ron, 1973. Personal communication (livestock point sources impacting Cataract Lake). IN Div. Water Poll. Contr., Indianapolis.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

Winters, John, 1975. Personal communication (lake morphometry). IN Div. Water Poll. Contr., Indianapolis.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
1805	CATARACT LAKE	0.058	1.660	466.667	10.744	15.000	0.013
1811	GEIST RESERVOIR	0.074	1.080	472.500	45.950	11.600	0.009
1817	JAMES LAKE	0.024	1.030	434.000	11.533	15.000	0.008
1827	MISSISSINEWA RESERVOIR	0.107	2.400	473.444	15.778	15.000	0.029
1828	MONROE RESERVOIR	0.025	0.325	438.823	6.947	15.000	0.007
1829	MORSE RESERVOIR	0.084	3.325	473.222	56.167	15.000	0.009
1836	WAWASEE LAKE	0.012	0.210	364.500	5.000	14.600	0.003
1837	WEBSTER LAKE	0.025	0.790	431.000	11.500	15.000	0.005
1839	WHITEWATER LAKE	0.084	1.620	470.167	33.083	15.000	0.012
1840	WINONA LAKE	0.035	1.250	444.667	11.211	15.000	0.011
1841	WESTLER LAKE	0.035	0.860	427.125	10.712	15.000	0.013
1842	WITMER LAKE	0.035	0.900	440.333	11.917	15.000	0.011
1843	LAKE MAXINKUCKEE	0.020	0.220	400.400	5.483	15.000	0.003
1844	TIPPECANOE LAKE	0.019	0.195	391.500	6.050	15.000	0.005
1845	DALLAS LAKE	0.029	0.830	413.333	10.067	15.000	0.014
1846	OLIN LAKE	0.012	1.460	403.333	4.867	14.900	0.003
1847	OLIVER LAKE	0.009	0.920	392.000	3.767	14.800	0.004
1848	SYLVAN LAKE	0.170	0.130	469.833	47.480	14.800	0.017
1849	HOVEY LAKE	0.062	1.050	489.333	84.267	7.600	0.024
1850	VERSAILLES LAKE	0.139	1.090	482.000	25.078	14.500	0.019
1851	BASS LAKE	0.040	0.250	471.375	29.367	7.000	0.012
1852	CROOKED LAKE	0.019	0.120	410.111	5.578	15.000	0.005
1853	LAKE JAMES	0.016	0.190	352.444	4.056	15.000	0.005
1854	LONG LAKE	0.204	1.920	442.667	16.100	15.000	0.150
1855	PIGEON LAKE	0.058	1.945	442.667	11.900	15.000	0.015
1856	MARSH LAKE	0.093	0.270	451.333	34.467	15.000	0.055
1857	HAMILTON LAKE	0.033	0.720	413.167	17.450	15.000	0.018

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1805	CATARACT LAKE	37 (9)	15 (4)	31 (8)	62 (16)	35 (0)	37 (9)	217
1811	GEIST RESERVOIR	27 (7)	35 (9)	15 (4)	12 (3)	92 (24)	62 (16)	243
1817	JAMES LAKE	73 (19)	42 (11)	58 (15)	50 (13)	35 (0)	65 (17)	323
1827	MISSISSINEWA RESERVOIR	12 (3)	4 (1)	8 (2)	38 (10)	35 (0)	8 (2)	105
1828	MONROE RESERVOIR	67 (17)	69 (18)	54 (14)	73 (19)	35 (0)	69 (18)	367
1829	MOWSE RESERVOIR	23 (6)	0 (0)	12 (3)	4 (1)	35 (0)	58 (15)	132
1836	WAWASEE LAKE	94 (24)	85 (22)	96 (25)	88 (23)	85 (22)	98 (25)	546
1837	WEBSTER LAKE	67 (17)	62 (16)	62 (16)	54 (14)	35 (0)	81 (21)	361
1839	WHITEWATER LAKE	19 (5)	19 (5)	23 (6)	19 (5)	35 (0)	42 (11)	157
1840	WINONA LAKE	50 (12)	27 (7)	38 (10)	58 (15)	35 (0)	52 (13)	260
1841	WESTLER LAKE	50 (12)	54 (14)	65 (17)	65 (17)	35 (0)	37 (9)	306
1842	WITMER LAKE	50 (12)	50 (13)	50 (13)	42 (11)	35 (0)	52 (13)	279
1843	LAKE MAXINKUCKEE	77 (20)	81 (21)	65 (22)	85 (22)	35 (0)	98 (25)	461
1844	TIPPECANOE LAKE	85 (22)	88 (23)	92 (24)	77 (20)	35 (0)	85 (22)	462
1845	DALLAS LAKE	62 (16)	58 (15)	69 (18)	69 (18)	35 (0)	31 (8)	324
1846	OLIN LAKE	94 (24)	23 (6)	81 (21)	92 (24)	73 (19)	92 (24)	455
1847	OLIVER LAKE	100 (26)	46 (12)	88 (23)	100 (26)	79 (20)	88 (23)	501
1848	SYLVAN LAKE	4 (1)	96 (25)	27 (7)	8 (2)	79 (20)	23 (6)	237
1849	HOVEY LAKE	31 (8)	38 (10)	0 (0)	0 (0)	96 (25)	12 (3)	177
1850	VERSAILLES LAKE	8 (2)	31 (8)	4 (1)	27 (7)	88 (23)	15 (4)	173
1851	BASS LAKE	42 (11)	77 (20)	19 (5)	23 (6)	100 (26)	46 (12)	307
1852	CROOKED LAKE	81 (21)	100 (26)	77 (20)	81 (21)	35 (0)	75 (19)	449
1853	LAKE JAMES	88 (23)	92 (24)	100 (26)	96 (25)	35 (0)	75 (19)	486
1854	LONG LAKE	0 (0)	12 (3)	44 (11)	35 (9)	35 (0)	0 (0)	126
1855	PIGEON LAKE	37 (9)	8 (2)	44 (11)	46 (12)	35 (0)	27 (7)	197
1856	MARSH LAKE	15 (4)	73 (19)	35 (9)	15 (4)	35 (0)	4 (1)	177
1857	HAMILTON LAKE	58 (15)	65 (17)	73 (19)	31 (8)	35 (0)	19 (5)	281

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1836	WAWASEE LAKE	546
2	1847	OLIVER LAKE	501
3	1853	LAKE JAMES	486
4	1844	TIPPECANOE LAKE	462
5	1843	LAKE MAXINKUCKEE	461
6	1846	OLIN LAKE	455
7	1852	CROOKED LAKE	449
8	1828	MONROE RESERVOIR	367
9	1837	WEBSTER LAKE	361
10	1845	DALLAS LAKE	324
11	1817	JAMES LAKE	323
12	1851	BASS LAKE	307
13	1841	WESTLER LAKE	306
14	1857	HAMILTON LAKE	281
15	1842	WITMER LAKE	279
16	1840	WINONA LAKE	260
17	1811	GEIST RESERVOIR	243
18	1848	SYLVAN LAKE	237
19	1805	CATARACT LAKE	217
20	1855	PIGEON LAKE	197
21	1856	MARSH LAKE	177
22	1849	HOVEY LAKE	177
23	1850	VERSAILLES LAKE	173
24	1839	WHITEWATER LAKE	157
25	1829	MORSE RESERVOIR	132
26	1854	LONG LAKE	126
27	1827	MISSISSINEWA RESERVOIR	105

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1805 CATARACT LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 759.6

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1805A1	762.0	7.39	13.79	13.25	14.84	10.53	9.40	6.80	1.64	1.95	3.06	5.89	5.49	7.79
1805A2	657.3	11.10	12.06	13.42	12.06	8.33	7.65	3.79	1.25	1.93	1.30	5.61	7.67	7.14
1805B1	34.4	0.396	0.481	0.708	0.651	0.425	0.311	0.193	0.065	0.062	0.065	0.170	0.311	0.319
1805D1	6.7	0.074	0.096	0.142	0.130	0.082	0.062	0.037	0.011	0.011	0.011	0.034	0.062	0.063
1805E1	6.5	0.071	0.091	0.136	0.125	0.079	0.062	0.037	0.008	0.011	0.011	0.031	0.062	0.060
1805E2	11.7	0.133	0.164	0.241	0.224	0.142	0.110	0.065	0.020	0.020	0.020	0.057	0.108	0.108
1805ZZ	43.0	0.510	0.623	0.878	0.821	0.538	0.396	0.235	0.082	0.079	0.085	0.210	0.396	0.403

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 759.6 TOTAL FLOW IN = 97.64
SUM OF SUB-DRAINAGE AREAS = 759.6 TOTAL FLOW OUT = 94.04

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1805A1	6	73	18.179	10	3.851				
	7	73	11.327	9	2.832				
	8	73	17.670	12	7.815				
	9	73	0.699	23	0.396				
	10	73	0.858	25	0.425				
	11	73	3.908	27	3.625				
	12	73	19.482	17	3.625				
	1	74	26.816	16	10.336				
	2	74	36.812	5	51.112	20	36.812		
	3	74	20.586	6	3.002	20	26.391		
	4	74	15.319	17	41.343				
	5	74	13.054	15	19.539				
1805A2	1	73	24.891	16	29.450				
	6	73	16.764	10	4.786				
	7	73	20.841	9	2.407				
	8	73	2.430	12	2.180				
	9	73	0.603	23	0.340				
	10	73	0.564	25	0.311				
	11	73	8.665	27	39.077				
	12	73	16.990	17	2.407				
	2	74	10.336	5	4.361	20	16.367		
	3	74	15.716	6	20.133	20	8.155		
	4	74	10.477	17	3.823				
	5	74	21.068	15	65.978				

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1805 CATARACT LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
180581	6	73	0.906	10	0.261				
	7	73	1.133	9	0.130				
	8	73	0.133	12	0.119				
	9	73	0.034	23	0.017				
	10	73	0.031	25	0.017				
	11	73	0.481	27	2.124				
	12	73	0.934	17	0.130				
	1	74	1.359	16	1.586				
	2	74	0.566	5	0.238	20	0.878		
	3	74	0.850	6	1.104	20	0.453		
	4	74	0.566	17	0.207				
	5	74	1.133	15	3.568				
180501	6	73	0.176	10	0.051				
	7	73	0.221	9	0.025				
	8	73	0.025	12	0.023				
	9	73	0.006	23	0.0				
	10	73	0.006	25	0.003				
	11	73	0.091	27	0.396				
	12	73	0.178	17	0.025				
	1	74	0.261	16	0.311				
	2	74	0.108	5	0.045	20	0.173		
	3	74	0.164	6	0.212	20	0.085		
	4	74	0.110	17	0.040				
	5	74	0.221	15	0.680				
180SE1	6	73	0.170	10	0.048				
	7	73	0.212	9	0.025				
	8	73	0.025	12	0.023				
	9	73	0.006	23	0.003				
	10	73	0.006	25	0.003				
	11	73	0.088	27	0.396				
	12	73	0.173	17	0.025				
	1	74	0.252	16	0.311				
	2	74	0.105	5	0.045	20	0.167		
	3	74	0.159	6	0.204	20	0.082		
	4	74	0.105	17	0.040				
	5	74	0.212	15	0.680				
180SE2	6	73	0.311	10	0.088				
	7	73	0.396	9	0.045				
	8	73	0.045	12	0.040				
	9	73	0.011	23	0.006				
	10	73	0.011	25	0.006				
	11	73	0.159	27	0.788				
	12	73	0.311	17	0.045				
	1	74	0.453	16	0.538				
	2	74	0.190	5	0.079	20	0.283		
	3	74	0.283	6	0.368	20	0.150		
	4	74	0.193	17	0.071				
	5	74	0.396	15	1.218				

TRIBUTARY FLOW INFORMATION FOR INDIANA 03/29/76

LAKE CODE 1805 CATARACT LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1805ZZ	6	73	1.133	10	0.311				
	7	73	1.416	9	0.164				
	8	73	0.164	12	0.147				
	9	73	0.040	23	0.023				
	10	73	0.037	25	0.020				
	11	73	0.595	27	2.633				
	12	73	1.161	17	0.164				
	1	74	1.699	16	1.982				
	2	74	0.708	5	0.283	20	1.104		
	3	74	1.076	6	1.359	20	0.566		
	4	74	0.708	17	0.258				
	5	74	1.444	15	4.446				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/03/30

180501
39 27 13.0 086 50 36.0 3
CATARACT LAKE
18119 INDIANA

051991

11EPALES 2111202
0014 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/10	15 05	0000	19.2		12	395	8.30	151	0.070	0.900	2.150	0.012
	15 05	0005	17.7	8.9		400	8.10	155	0.090	0.800	2.100	0.019
	15 05	0010	16.1	8.9		395	7.90	160	0.170	0.700	2.050	0.027
73/08/08	13 00	0000	27.0		12	263	8.70	106	0.090	1.500	0.670	0.013
	13 00	0005	25.0	2.8		301	7.50	124	0.220	1.300	0.650	0.013
	13 00	0010	23.5	2.6		399	7.60	184	0.320	1.400	0.910	0.019
73/10/10	16 20	0000	24.5	13.0	12	373	8.80	160	0.140	2.700	0.060	0.019

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/10	15 05	0000	0.097	5.9
	15 05	0005	0.101	
	15 05	0010	0.109	
73/08/08	13 00	0000	0.118	19.6
	13 00	0005	0.121	
	13 00	0010	0.201	
73/10/10	16 20	0000	0.196	9.9

STORET RETRIEVAL DATE 76/03/30

180502
39 27 43.0 086 53 05.0 3
CATARACT LAKE
18119 INDIANA
051991

11EPALES 2111202
0040 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/10	15 30	0000	17.6		60	390	8.10	144	0.070	0.800	2.820	0.011
	15 30	0006	17.4	9.5		390	8.10	143	0.080	0.700	2.820	0.013
	15 30	0015	16.2	8.6		395	8.00	146	0.090	0.800	2.780	0.013
	15 30	0022	15.3	5.4		430	7.80	160	0.150	0.700	2.590	0.018
	15 30	0036	11.9	4.8		420	7.70	150	0.260	1.100	2.560	0.022
73/08/08	12 40	0000	27.9		28	261	8.90	98	0.100	1.500	1.230	0.008
	12 40	0005	27.7	10.8		260	8.80	99	0.070	1.300	1.170	0.020
	12 40	0015	23.8	0.9		242	7.40	108	0.080	0.700	1.830	0.049
	12 40	0025	23.1	1.0		367	8.20	167	0.360	0.900	1.160	0.030
73/10/10	16 30	0000	23.0		32	299	8.60	130	0.100	0.800	0.040	0.007
	16 30	0005	22.4	6.8		298	8.10	128	0.150	0.800	0.040	0.008
	16 30	0015	22.3	5.0		301	7.70	128	0.220	0.700	0.040	0.008
	16 30	0020	22.0	0.2		318	7.40	139	0.610	1.300	0.030	0.009
	16 30	0026	21.3	0.6		410	7.40	187	0.550	1.400	0.050	0.014

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/10	15 30	0000	0.036	10.1
	15 30	0006	0.055	
	15 30	0015	0.043	
	15 30	0022	0.045	
	15 30	0036	0.062	
73/08/08	12 40	0000	0.034	4.4
	12 40	0005	0.059	
	12 40	0015	0.069	
	12 40	0025	0.066	
73/10/10	16 30	0000	0.049	21.1
	16 30	0005	0.042	
	16 30	0015	0.038	
	16 30	0020	0.087	
	16 30	0026	0.146	

STORET RETRIEVAL DATE 76/03/30

180503
39 28 42.0 086 53 57.0 3
CATARACT LAKE
18133 INDIANA
051991

11EPALES 2111202
0040 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/05/10	15 50	0000	17.4		60	395	7.60	138	0.050	0.400	2.790	0.009
	15 50	0006	17.2	10.0		380	8.00	139	0.050	0.400	2.880	0.009
	15 50	0015	17.0	8.6		380	8.00	139	0.070	0.600	2.780	0.011
	15 50	0025	14.9	8.5		400	7.80	138	0.110	0.700	2.820	0.017
	15 50	0036	12.0	9.1		405	7.70	150	0.310	1.000	2.800	0.023
73/08/08	12 15	0000	27.2		36	260	8.20	99	0.100	1.100	1.340	0.009
	12 15	0005	27.2	9.0		264	8.50	97	0.100	1.000	1.380	0.024
	12 15	0015	23.6	6.1		230	7.20	93	0.120	0.700	1.460	0.038
	12 15	0023	23.0	0.2		262	7.20	108	0.180	0.800	1.630	0.044
	12 15	0033	21.9	0.8		260	7.20	115	0.470	1.100	1.270	0.044
73/10/10	17 00	0000	23.4		48	297	8.30	124	0.200	1.400	0.060	0.007
	17 00	0005	22.8	7.2		293	8.20	125	0.240	0.800	0.060	0.012
	17 00	0015	22.3	2.0		297	7.50	128	0.450	0.900	0.050	0.015
	17 00	0025	21.4	0.0		333	7.20	153	1.730	2.300	0.040	0.010
	17 00	0035	19.0	0.0		394	7.00	200	4.880	6.200	0.050	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/05/10	15 50	0000	0.031	12.5
	15 50	0006	0.050	
	15 50	0015	0.037	
	15 50	0025	0.045	
	15 50	0036	0.046	
73/08/08	12 15	0000	0.041	6.0
	12 15	0005	0.057	
	12 15	0015	0.060	
	12 15	0023	0.078	
	12 15	0033	0.080	
73/10/10	17 00	0000	0.032	7.2
	17 00	0005	0.038	
	17 00	0015	0.040	
	17 00	0025	0.087	
	17 00	0035	0.268	

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/03/30

1805A1
39 29 15.0 086 55 30.0 4
MILL CREEK
18 7.5 POLAND
U/CATARACT LAKE 051991
BANK SAMPLE AT CAGLE MILL GAGING STATION
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	14	10	2.040	1.200	0.160	0.007	0.040
73/07/09	16	30	3.000	2.310	0.470	0.015	0.040
73/08/12			1.340	1.000	0.260	0.032	0.080
73/09/23	10	30	0.410	1.000	0.310	0.018	0.045
73/10/25	18	00	0.320	1.800	0.580	0.005K	0.025
73/11/27	17	00	0.290	1.000	0.336	0.012	0.190
73/12/17	11	45	2.100	1.300	0.192	0.060	0.095
74/01/16	12	00	3.080	0.800	0.104	0.064	0.090
74/02/05	12	00	2.900	0.600	0.090	0.065	0.080
74/02/20	13	03	2.940	1.400	0.090	0.055	0.080
74/03/06	12	00	2.600	1.200	0.072	0.035	0.110
74/03/20	12	00	2.600	0.700	0.065	0.035	0.065
74/04/17	13	00	2.640	0.900	0.025	0.005	0.040
74/05/15	12	50	1.920	1.600	0.150	0.015	0.050

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1805A2
39 25 59.0 086 48 48.0 4
MILL CREEK
18 7.5 CATARACT
I/CATARACT LAKE 051991
SEC RD BRDG .5 N OF CATARACT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	13 30		4.900	0.620	0.080	0.060	0.090
73/07/09	16 00		3.400	1.260	0.115	0.046	0.075
73/08/12			1.080	2.400	0.052	0.032	0.110
73/09/23	09 50		0.490	1.400	0.046	0.034	0.095
73/10/25	17 15		0.210	0.550	0.044	0.042	0.080
73/11/27	16 20		4.700	1.200	0.036	0.116	0.440
73/12/17	11 00		2.900	0.600	0.076	0.024	0.040
74/01/16	11 00		3.520	0.700	0.084	0.040	0.125
74/02/05	11 00		3.960	0.400	0.050	0.025	0.035
74/02/20	11 00		3.100	1.800	0.105	0.075	0.250
74/03/06	11 00		3.600	0.700	0.020	0.035	0.165
74/03/20	11 00		3.900	0.500	0.015	0.025	0.050
74/04/17	11 30		3.100	0.800	0.065	0.025	0.040
74/05/15	11 00		4.500	1.000	0.065	0.030	0.080

STORET RETRIEVAL DATE 76/03/30

180581
39 30 16.0 086 48 05.0 4
DOE CREEK
18 7.5 CLOVERDALE
T/CATARACT LAKE 051991
SEC RD BRDG AT S END OF CLOVERDALE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	13 20		3.900	0.730	0.126	0.250	0.290
73/07/09	17 00		3.700	1.680	0.150	0.280	0.420
73/08/12			1.160	4.000	0.210	0.230	0.890
73/09/23	09 30		2.400	0.800	0.054	0.650	0.720
73/10/25	17 00		3.400	1.400	0.110	0.990	1.150
73/11/27	16 10		4.400	0.800	0.088	0.116	0.345
73/12/17	10 30		3.800	1.700	0.420	0.140	0.180
74/01/16	10 20		2.760	0.700	0.132	0.060	0.110
74/02/05	10 00		4.300	1.200	0.240	0.070	0.095
74/02/20	10 30		2.200	1.100	0.175	0.060	0.080
74/03/06	10 30		2.400	0.500	0.035	0.030	0.080
74/03/20	10 30		3.000	0.600	0.040	0.032	0.055
74/04/17	10 30		2.800	1.000	0.040	0.040	0.075
74/05/15	10 30		1.010	2.700	0.075	0.030	

STORET RETRIEVAL DATE 76/03/30

180501
39 30 55.0 086 50 00.0 4
UNNAMED STREAM
18 7.5 CLOVERDALE
T/CATARACT LAKE 051991
RT 343 BRDG 1.5 MI W OF CLOVERDALE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	11	20	0.490	0.460	0.027	0.010	0.030
73/07/09	17	40	0.390	0.460	0.042	0.015	0.030
73/08/12			0.330	0.480	0.027	0.008	0.045
73/10/25	16	40	0.400	0.600	0.022	0.011	0.050
73/11/27	15	45	0.790	0.600	0.044	0.016	
73/12/17	10	05	0.510	0.400	0.036	0.008	0.065
74/01/16	09	20	0.660	0.600	0.072	0.020	0.060
74/02/05	09	15	0.560	0.200	0.035	0.010	0.010
74/02/20	09	30	0.420	0.300	0.030	0.010	0.020
74/03/06	09	30	0.300	0.300	0.015	0.010	0.040
74/03/20	09	30	0.290	0.200	0.030	0.010	0.010
74/04/17	09	30	0.240	0.200	0.015	0.005K	0.015
74/05/15	09	00	1.800	3.900	1.200	0.330	1.250

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1805E1
39 29 55.0 086 50 00.0 4
FERGUSON BRANCH
18 7.5 CLOVERDALE
T/CATARACT LAKE 051991
ONDRY RD BRDG 1.25 MI W OF CLOVERDALE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	13 10		0.530	0.330	0.031	0.014	0.035
73/07/09	16 45		0.400	0.480	0.037	0.011	0.020
73/08/12			0.570	0.350	0.075	0.014	
73/09/23	09 30		0.046	0.230	0.022	0.014	0.035
73/10/25	16 50		0.039	0.450	0.018	0.014	0.035
73/11/27	16 00		0.690	0.800	0.040	0.020	0.195
73/12/17	10 15		0.540	1.000	0.052	0.005K	0.015
74/01/16	10 00		0.830	0.800	0.068	0.028	0.070
74/02/05	09 30		0.810	0.200	0.020	0.015	0.015
74/02/20	10 00		0.650	0.500	0.030	0.010	0.025
74/03/06	10 00		0.528	0.300	0.025	0.010	0.050
74/03/20	10 00		0.588	0.600	0.040	0.010	0.015
74/04/17	10 00		0.352	1.600	0.035	0.005	0.015
74/05/15	10 00		0.360	1.600	0.020	0.025	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1805E2
39 30 30.0 086 49 30.0 4
FERGUSON CREEK
18 7.5 CATARACT
T/CATARACT LAKE 051991
ONDRY RD BRDG 2.5 MI WSW OF CLOVERDALE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/06/10	11 25		0.450	0.310	0.038	0.010	0.030
73/07/09	17 30		0.340	2.100	0.069	0.012	0.020
73/08/12			0.430	2.700	0.069	0.005K	
73/09/23	09 10		0.198	0.290	0.025	0.010	0.025
73/10/25	16 30		0.180	0.850	0.022	0.012	0.025
73/11/27	15 55		0.672	1.000	0.026	0.028	0.180
73/12/17	10 00		0.640	0.500	0.052	0.008	0.030
74/01/16	09 00		1.850	4.200	1.500	0.400	0.760
74/02/05	09 00		3.700	2.100	0.830	0.330	0.450
74/02/20	09 00		2.500	2.000	0.540	0.240	0.330
74/03/06	09 00		2.940	1.400	0.290	0.155	0.310
74/03/20	09 00		3.200	1.500	0.420	0.190	0.280
74/04/17	09 00		3.080	3.800	1.400	0.440	0.550
74/05/15	09 30		0.184	1.900	0.035		0.380

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/03/30

1805CA AS1805CA P001000
39 30 45.0 086 48 07.0 4
CLOVERDALE
18 7.5 CLOVERDALE
T/CATARACT LAKE 051991
RABBIT RUN/DOE CREEK
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/06/01	09	00	0.240	45.000	0.160	6.000	12.000	0.062	0.062
73/07/02	09	00	0.130	32.800	9.000	3.575	5.250	0.062	0.062
73/08/01	09	00	0.130	19.800	1.100	2.200	4.300	0.062	0.062
73/09/01	09	00	0.021	39.000		4.600	7.870	0.062	0.062
73/10/01	09	00	0.040	37.800	10.600	3.700	10.500	0.062	0.062
73/11/05	09	00		43.500	16.000	3.600	11.500	0.090	0.085
73/12/07	10	00	0.340	21.000	2.300	2.700	4.700	0.099	0.069
74/01/10	09	30	0.120	22.000	6.160	3.400	5.500	0.066	0.066
74/02/06	10	20	0.160	20.000	4.200	3.600	5.500	0.066	0.069
74/03/06	08	45	0.040	9.000	0.100	1.500	2.200	0.067	0.068
74/04/04	09	00	0.400	10.000	0.370	1.550	2.800	0.075	0.072
74/05/09	09	00	0.360	26.000	6.600	3.300	6.400	0.071	0.075
74/06/04	09	30	0.360	29.000	7.000	5.250	7.800	0.091	0.080